

## Claims

- [c1] 1. An electrically assisted, manually powered unit, a manual drive element receiving a manual input force from an operator, an electric motor for providing an assist force, a transmission arrangement for receiving a driving force from said manual drive element and said electric motor and driving said unit, a force sensor for sensing the manual force applied to said manual drive element and delivering an output signal indicative of said manual force, a control for controlling the operation of said electric motor, said control having a sensor input stage receiving the signal from said force sensor and a logic for determining the operation of said electric motor from at least said signal from said force sensor, said force sensor providing said force signal without necessitating any significant displacement of a component thereof.
- [c2] 2. An electrically assisted, manually powered unit as set forth in claim 1, wherein the force sensor is a magnetostrictive sensor.
- [c3] 3. An electrically assisted, manually powered unit as set forth in claim 1, wherein the force sensor is a stress detection sensor.
- [c4] 4. An electrically assisted, manually powered unit as set forth in claim 1, wherein the unit comprises a propulsion element for propelling a vehicle along a terrain.
- [c5] 5. An electrically assisted, manually powered unit as set forth in claim 4, wherein the propulsion element comprised a wheel of a land vehicle.
- [c6] 6. An electrically assisted, manually powered unit as set forth in claim 5, wherein the vehicle comprises a bicycle.
- [c7] 7. An electrically assisted, manually powered unit as set forth in claim 5, wherein the vehicle comprises a wheelchair.
- [c8] 8. An electrically assisted, manually powered unit as set forth in claim 1, wherein the unit comprises a drum and the manual drive element comprises a crank handle.
- [c9] 9. An electrically assisted, manually powered unit as set forth in claim 1, wherein

the unit comprises a dirigible wheel and the manual drive element comprises a steering shaft.

- [c10] 10.An electrically assisted, manually powered unit as set forth in claim 1, wherein the manual drive element is moveable in two, opposite directions.
- [c11] 11.An electrically assisted, manually powered unit as set forth in claim 10, wherein the force sensor senses the manual force in only one direction and the electric motor for providing an assist force only in that one direction.
- [c12] 12.An electrically assisted, manually powered unit as set forth in claim 10, wherein the force sensor senses the manual force in both directions and the electric motor for provides an assist force in both direction.
- [c13] 13.An electrically assisted, manually powered unit as set forth in claim 1, wherein the force applied to the force sensor is derived from a helical spline connection in the transmission arrangement.
- [c14] 14.An electrically assisted, manually powered unit as set forth in claim 13, wherein the helical spline connection is in the portion of the transmission arrangement connecting the manual drive element to the unit.
- [c15] 15.An electrically assisted, manually powered unit as set forth in claim 14, wherein the manual drive element is moveable in two, opposite directions.
- [c16] 16.An electrically assisted, manually powered unit as set forth in claim 15, wherein the force sensor senses the manual force in only one direction and the electric motor for providing an assist force only in that one direction.
- [c17] 17.An electrically assisted, manually powered unit as set forth in claim 16, wherein a thrust taking member resists relative axial movement of the helical spline connection when the manual force of the drive element in the direction opposite to the one direction.
- [c18] 18.An electrically assisted, manually powered unit as set forth in claim 14, wherein the unit comprises a propulsion element for propelling a vehicle along a terrain.

- [c19] 19. An electrically assisted, manually powered unit as set forth in claim 15, wherein the vehicle is a bicycle and the manual drive element comprises a pedal driven crankshaft.
- [c20] 20. An electrically assisted, manually powered unit as set forth in claim 19, wherein the transmission arrangement comprises a driving sprocket driven by the pedal driven crankshaft, a chain driven by the driving sprocket and a driven sprocket associated with a driven wheel which wheel comprises the unit.
- [c21] 21. An electrically assisted, manually powered unit as set forth in claim 17, wherein the helical spline connection is in the connection between the driving sprocket and the pedal driven crankshaft.
- [c22] 22. An electrically assisted, manually powered unit as set forth in claim 21, wherein the helical spline connection is in the connection between the driven sprocket and the driven wheel.
- [c23] 23. An electrically assisted, manually powered unit as set forth in claim 15, wherein the vehicle is a wheelchair and the manual drive element comprises a hand wheel.
- [c24] 24. An electrically assisted, manually powered unit as set forth in claim 15, wherein the unit comprises a dirigible wheel and the manual drive element comprises a steering shaft.
- [c25] 25. An electrically assisted, manually powered unit as set forth in claim 15, wherein the unit comprises a drum and the manual drive element comprises a crank handle.
- [c26] 26. An electrically assisted, manually powered unit as set forth in claim 1, wherein the force sensor is connected to the load in a circuit having a compensating sensor that does not experience the load but is in a proximate position to said force sensor to provide temperature compensation.
- [c27] 27. An electrically assisted, manually powered unit as set forth in claim 26, wherein the force sensor comprises a first electrical device providing a signal indicative of applied force, the compensating sensor comprises a second

electrical device providing a signal indicative of applied force, the manual force being applied only to said first electrical device, said first and said second electrical devices being positioned in proximity to each other so as to experience the same temperature and a circuit connecting said first and said second electrical devices to provide a temperature compensated signal to said sensor input stage of said control.

[c28] 28.An electrically assisted, manually powered unit as set forth in claim 27 wherein the circuit connecting the first and the second electrical devices is a bridging circuit containing first and second resistors in respective series circuits with said first and said second electrical devices.

[c29] 29.An electrically assisted, manually powered unit, a manual drive element receiving a manual input force from an operator, an electric motor for providing an assist force, a transmission arrangement for receiving a driving force from said manual drive element and said electric motor and driving said unit, a force sensor for sensing the manual force applied to said manual drive element and delivering an output signal indicative of said manual force, a control for controlling the operation of said electric motor, said control having a sensor input stage receiving the signal from said force sensor and a logic for determining the operation of said electric motor from at least said signal from said force sensor, said force sensor including a first electrical device providing a signal indicative of applied force, a second electrical device providing a signal indicative of applied force, the manual force being applied only to said first electrical device, said first and said second electrical devices being positioned in proximity to each other so as to experience the same temperature and a circuit connecting said first and said second electrical devices to provide a temperature compensated signal to said sensor input stage of said control.

[c30] 30.An electrically assisted, manually powered unit as set forth in claim 29 wherein the circuit connecting the first and the second electrical devices is a bridging circuit containing first and second resistors in respective series circuits with said first and said second electrical devices.

[c31] 31.An electrically assisted, manually powered reel for a line, a manual drive

element receiving a manual input force from an operator, an electric motor for providing an assist force, a transmission arrangement for receiving a driving force from said manual drive element and said electric motor and driving said reel, a force sensor for sensing the manual force applied to said manual drive element and delivering an output signal indicative of said manual force, a control for controlling the operation of said electric motor, said control having a sensor input stage receiving the signal from said force sensor and a logic for determining the operation of said electric motor from at least said signal from said force sensor.